Stamp Goes Here

Student Notes

Science on Saturday

Oct 20, 2012

It's Gust About Time: Harnessing the Wind for Our Future Energy Needs

Presenters:
Dr. Jeff Mirocha, Lawrence Livermore National Laboratory
Dr. Sonia Wharton, Lawrence Livermore National Laboratory

Summary:
Can we produce much of the energy we need from clean, renewable sources? Wind energy can lead the way. We will learn why the wind blows, where the wind blows the best, how energy can be generated from the wind, and how science and engineering can ensure a reliable and abundant supply of green, renewable energy to power our future. It's "gust" about time.

Questions to think about:

1. Why does the wind blow?
2. How do modern wind turbines harness the wind?
3. What roles do science and engineering play in improving wind energy supply?
4. What challenges remain for you to solve?

Student Lecture Notes:

1. Why does the wind blow? Where does the wind come from?

2. Warm air is _____ dense and thus _____ causing more dense cooler air from the colder ocean to flow inland.

3. What determines the power of a wind turbine (Hint: Power $=1/2C_PdU^3A$)?

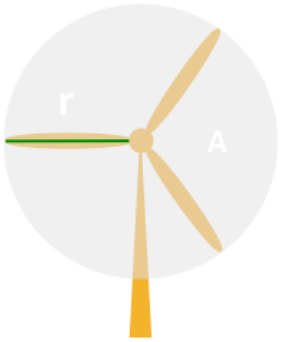
4. Which atmospheric conditions are best for wind energy?

5. How much more power can we produce if we double the wind speed?

6. How much more power can we produce if we double the length of each blade?

7. Why are modern wind turbines so tall?

8. How do the winds in California compare to the rest of the US?



Speaker Bios:

Jeff Mirocha is an atmospheric scientist and the technical leader of LLNL's wind energy research group. Dr. Mirocha's interests include investigation and modeling of atmospheric turbulence, flow over complex terrain, and how such flows impact wind energy capture. Dr. Mirocha holds B.S. and B. A. degrees in Geography and Mathematics from Arizona State University, and M.S. and Ph.D. degrees in Atmospheric, Planetary and Atmospheric Sciences from the University of Colorado at Boulder

Sonia Wharton is a researcher in the Climate/Carbon Science Group at Lawrence Livermore National Laboratory. Her primary research involves understanding how conditions in the atmospheric boundary layer impact wind power generation. She holds a B.S. in Biology and Environmental Studies from Baylor University and a Ph.D. in Atmospheric Science from UC Davis.